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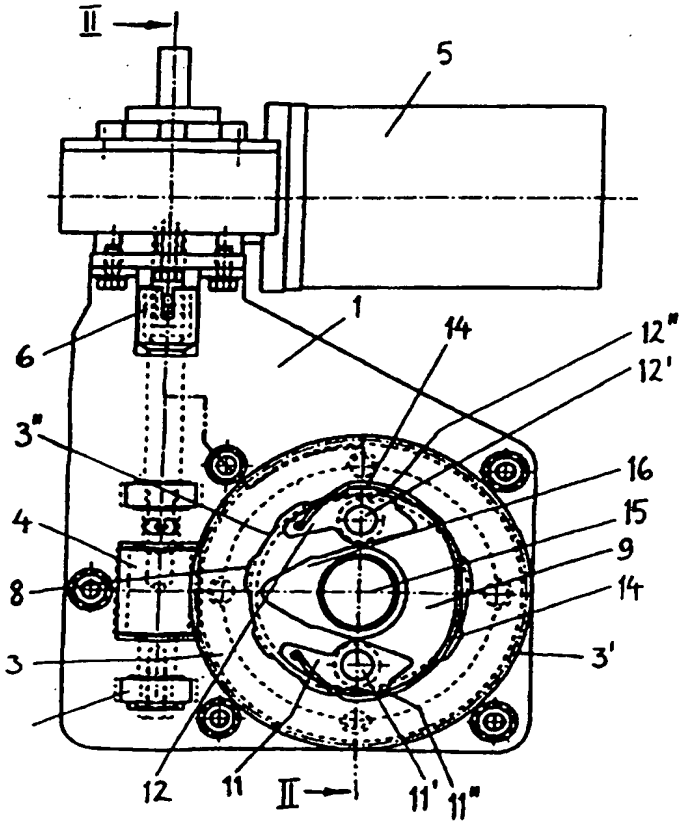
(54) Title: POWER TRANSFER DEVICE

(57) Abstract

A power transmission device having a disengagement mechanism (7), whereby the device when not driven by a motor (5) may be operated manually. With motor drive, power is transmitted via a worm wheel (3) to a pawl (11 or 12) in a pawl mechanism, and therefrom further on to a boss (9) on which the pawls are pivotably mounted, said boss (9) being mechanically coupled to an apparatus (10) which is to be driven. The pawls (11, 12) are spring tensioned by means of a common arcuate spring (14). On manual operation, a shaft (15) mounted coaxially with the boss and rotatable relative thereto is turned in one or the other direction. The shaft (15) is provided with an arm (16) which, on contact with one of the pawls (11, 12), brings the pawl out of engagement with the worm wheel and causes rotation of the boss (9) and thereby of the apparatus (10), while the other pawl (12 or 11) on the influence of the spring (14) is caused to slip along an inner circumferential area (3'') of the worm wheel (3).



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POWER TRANSFER DEVICE

The present invention relates to a power transmission device having a disengagement mechanism, comprising an annular area which is formed with uniformly spaced recesses along the inner circumference thereof, a boss mechanically connected to the apparatus that is to be driven, a pawl mechanism consisting of two pawls which are pivotably mounted on the boss via a respective bolt connection, at opposite sides of the axis of rotation of the boss, said two pawls being spring loaded and each having a part adapted to permit engagement with an adjacent one of said recesses, and a shaft for operation of the device, where said shaft is coaxially and rotatably mounted in relation to the boss, said shaft being provided with a pawl actuating arm which on turning of the shaft comes into contact with one of the pawls and thereby, through gentle rotation thereof, causes it to disengage from the recesses on the annular area, while said second pawl on the influence of spring action will slip along the edge of said annular area and slide in and out of the recesses.

The present invention is well suited where there is required a combination of motor control and manual operation of apparatuses. In particular, the present invention aims to provide a solution in connection with the tensioning of springs in the coupling mechanism on medium voltage switches, where the tensioning may be done by motor drive and where it is possible to provide power transmission in both rotational directions, right and left, and where manual operation of the apparatus also is possible.

The known devices are burdened with various disadvantages. If for one reason or another the motor should stop in an intermediate position, it would not be possible without further intervention to couple manually to the power transmission in the right or left rotational direction. On some motor controllers, if the motor should stop in an intermediate position it is only possible to complete the movement manually. In such a case, however, it is not possible to execute a manual maneuver in the opposite direction without an extra uncoupling, or similar procedure. If for one reason or another the motor fails to stop at an end position, but continues until it is blocked, it is not possible to ontain manual couplings before the motor is rendered reversible or is dismounted.

The present invention thus aims to solve the problems associated with the known art, and according to the present invention this is accomplished by the power transmission device having the characterizing feature that it may either be operated manually, when

not driven by a motor; or, when driven by a motor, it may be manually overridden; that the annular area is situated on an annular worm wheel which by the outer, toothed perimeter thereof forms a mechanical connection with the motor via a worm screw, said annular area being situated radially within said outer, toothed perimeter; that the two pawls are spring loaded by means of a common spring which is pivotably attached by one end thereof onto one of the pawls at an end section thereof, and by its other end is pivotably attached onto the other pawl at an end section thereof and on the same side of the rotational axis of the boss where the two pawls are spring loaded by means of the common spring; that each pawl is provided with a bead-shaped part permitting said engagement with an adjacent one of said recesses, and where during operation of the motor, such that the worm wheel rotates in one or the other direction, one or the other of the pawls enters into engagement with one of said recesses; and that said shaft is adapted for manual operation of the device, wherein said pawl actuating arm comes into said contact with one of the pawls through said manual rotation of the shaft, whereby the boss is effectively disengaged from potential motor drive.

According to one embodiment of the device, the spring extends over an arc in the range of 200-340°, preferably about 260-290°.

In the preferred utilization of the device, according to the invention, said apparatus is a spring tensioning means for a coupling mechanism on a medium voltage switch.

The invention will now be explained in more detail with reference to the enclosed figures.

Figure 1 is a side view of the device, according to the invention.

Figure 2 is a sectional view at line II-II in Figure 1.

Figures 3 and 4 illustrate motor control in, respectively, a clockwise and a counterclockwise direction.

Figures 5 and 6 illustrate manual operation of the device in, respectively, a clockwise and a counterclockwise direction.

Figure 7 illustrates manual operation in a clockwise direction, where both pawls are disengaged from the device's worm wheel.

The device according to the invention consists basically of two plates 1, 2, preferably of steel, between which are mounted a worm wheel 3 and a worm screw 4. The motor for the device is designated by reference number 5 and is connected to the worm screw via coupling 6. On operation of motor 5 the force therefrom is transmitted via the motor shaft and coupling 6 to worm screw 4 and therefrom further on to worm wheel 3 via the toothed engagement between the worm screw and the worm wheel. When motor 5 rotates, the worm wheel 3 will consequently also turn around.

In the center of worm wheel 3 is positioned an automatic disengagement mechanism 7 for disengagement of motor 5 when manual operation of the device is desired. The annular worm wheel 3 has an outer, toothed perimeter 3' and an annular area 3" situated radially within this perimeter 3'. This annular area 3" is formed with uniformly spaced recesses 8 along the circumference thereof . A boss 9 is mechanically connected to the apparatus to be driven, indicated here by a dash-dotted line and reference number 10.

The disengagement mechanism 7 is composed of a pawl mechanism consisting of two pawls 11 and 12. The pawls have respective bolt connections 11', 12' mounted on boss 9 at opposite sides of the rotational axis 13 of the boss. The two pawls 11, 12 are spring loaded by means of a common spring 14. Spring 14 is pivotably attached by one end thereof onto one of the pawls 11 at an end section thereof. The other end of the spring is pivotably attached onto the other pawl 12 at an end section thereof. The two end points of spring 14 are, as clearly indicated in Figure 1, positioned on the same side of the rotational axis 13 of the boss.

Pawls 11 and 12 each have a respective bead part 11", 12". This part permits engagement with an adjacent one of said recesses 8. The fact that pawls 11 and 12 are spring loaded by means of spring 14 has the effect of causing one or the other pawl to engage with said recess 8. The force transmitted from motor 5 via worm gear 4 and worm wheel 3 will then be transmitted further via the inner perimeter of the worm wheel and said recess 8 to boss 9 via bolt 11' or 12', which is secured to boss 9. Boss 9 is, as mentioned previously, in mechanical engagement with the apparatus 10 to be driven.

With motor control, as shown in Figures 3 and 4, where worm wheel 3 turns toward the right, i.e., clockwise, the bead 11" on pawl 1 will engage with the adjacent recess 8 on worm wheel 3. Because of the spring connecting pawls 11 and 12, the spring will

thereby seek to rotate pawl 12 in a clockwise direction about bolt 12'. This will have the effect of preventing pawl 12 from engaging with the inner circumferential area 3" on worm wheel 3. The power transmission coming from motor 5 via coupling 6, worm gear 4 and worm wheel 3 will be transferred on to the apparatus 10 via the engagement between pawl 11 and the recess 8 on worm wheel 3 and bolt 11' to boss 9.

With motor drive in the opposite direction, as indicated in Figure 4, worm wheel 3 will move in a counterclockwise direction. The same explanation as that given immediately above for Figure 3 will pertain to Figure 4, although with the slight difference that, in this case, it is pawl 12 with its bead 12' that engages with a recess 8 on the inner circumferential area 3" of worm wheel 3.

On manual operation, a lever (not shown) is positioned on a toothed shaft 15. This is connected directly to a pawl actuating arm 16. Shaft 15 is coaxially and rotatably mounted in relation to the boss. On manual turning of shaft 15, the arm 16 will move toward one or the other of pawls 11, 12. The power is then transmitted via respective bolt 11' or 12' to boss 9, which is engaged with the apparatus 10 to be driven. When arm 16 comes into contact with pawl 11 or 12, the pawl in question will be brought out of engagement with the adjacent recess 8 on worm wheel 3. The other pawl which is not directly affected by arm 16 will simultaneously be brought out of engagement with recesses 8 on worm wheel 3 by means of spring 14. Thus, even if motor 5 were possibly in operation, or were to be put into operation, when actuating arm 16 influences one of the pawls, no transmission of power will take place from worm wheel 3 via the pawls and their associated bolts to the boss and thereby to the apparatus to be driven. Looking more closely at Figure 5, one will see that arm 16 influences pawl 12 in such a way as to prevent it from engaging with worm wheel 3. Due to the influence of spring 14 on pawl 11, the effect is that this will not come into engagement with the worm wheel, either, but will simply be caused to slip along the edge of the worm wheel's annular area 3". The power is thereby transmitted directly from shaft hub 15 via arm 16, pawl 12, pawl bolt 12' and to boss 9, and from there directly to the apparatus 10 which is to be actuated. As opposed to the situation illustrated in Figure 5, Figure 6 shows the rotation of shaft 15 in a counterclockwise direction. The explanation would be the same as for Figure 5, however, with the only difference being that, in this case, arm 16 will actuate pawl 11. For further elucidation of the example described in connection with Figure 5, reference is made to Figure 7, which illustrates an intermediate position for pawls 11 and 12 between the passing of recesses 8.

As is shown in more detail in Figures 1, 3-7, the pawls have a long arcuate sector 17 and a short arcuate sector 18. When one or the other of pawls 11 or 12 engages with worm wheel 3, it will be sector 18 of the pawl in question that bears against an edge adjacent to the recess 8 in which the pawl bead lies. The pawl in question is thereby prevented from having its bead tipped out of the recess. The long, arcuate sector 17 of the pawl is particularly important for attaining an optimal moment arm on which spring 14 may work, so that when the pawl moves in relation to worm wheel 3, the long curve will at all times ensure that the bead on the pawl in question is brought out of engagement with worm wheel 3 on the influence of spring 14. On comparing Figures 5 and 6, for example, it will be apparent that when shaft 15 is turned in a clockwise direction, i.e., toward the right, arm 16 moves toward pawl 12. Pawl 12 is thereby tipped out of engagement with worm wheel 3. This thus means that motor 5 is no longer able to actuate boss 9. It is admittedly apparent that pawl 11 is to a certain degree engaged with worm wheel 3, but it is only spring 14 that is holding the pawl 11; thus the bead 11" thereon will slip in and out of the recesses in turn, without being allowed to move into locking engagement. On further rotation of shaft 15 toward the right, as shown in Figure 7, pawl 11 will rotate in a counterclockwise direction about bolt 11'. The locking engagement with worm wheel 3 therefore ceases, and it will thus be understood that manual operation in this manner could be carried out in both rotational directions and independently of the position of the motor, which in turn affects the position of the worm wheel.

When, for example, the next operation involving motor 5 is to occur, i.e., when shaft 15 and arm 16 are back in normal position, as shown in Figures 1, 3 and 4, pawls 11 and 12 will be pressed against the annular area 3" of worm wheel 3 with the aid of spring 14. Depending on the direction of rotation for worm wheel 3, either the one pawl 11 or the other pawl 12 will engage with the first emerging recess 8 that it meets in worm wheel 3. This situation is clearly illustrated in Figures 3 and 4.

Patent Claims

1.

A power transmission device having a disengagement mechanism (7), comprising an annular area (3") which is formed with uniformly spaced recesses (8) along the inner circumference thereof,

a boss (9) mechanically connected to the apparatus (10) which is to be driven, a pawl mechanism (11, 12, 14) consisting of two pawls (11; 12) which are pivotably mounted on the boss via respective bolt connections (11', 12'), at opposite sides of the axis of rotation (13) of the boss, said two pawls being spring loaded and each having a part adapted to permit engagement with an adjacent one of said recesses (8), and a shaft (15) for operation of the device, where the shaft (15) is coaxially and rotatably mounted in relation to the boss (9), said shaft (15) being provided with a pawl actuating arm (16) which on turning of the shaft (15) comes into contact with one of the pawls (11 or 12) and thereby, through gentle rotation thereof (11 or 12), causes it to disengage from the recesses (8) on the annular area (3"), and while said second pawl (12 or 11) will on the influence of the spring action (14) slip along the edge of said annular area (3") and slide in and out of the recesses (8), characterized in that

the device may either be operated manually, when not driven by a motor (5), or, when driven by a motor (5), it may be manually overridden,

that the annular area (3") is situated on an annular worm wheel (3) which by the outer, toothed perimeter (3') thereof forms a mechanical connection with the motor (5) via a worm screw (4), said annular area (3") being situated radially within said outer, toothed perimeter (3'),

that the two pawls are spring loaded by means of a common spring (14) which is pivotably attached by one end thereof onto one of the pawls (11) at an end section thereof and with its other end is pivotably attached onto the other pawl (12) at an end section thereof and on the same side of the rotational axis (13) of the boss (9), where the two pawls are spring loaded by means of a common spring, that each pawl is provided with a bead-shaped part (11"; 12") permitting said engagement with an adjacent one of said recesses (8), and where during operation of the motor (5), such that the worm wheel (3) rotates in one or the other direction, one or the other of the pawls (11; 12) engages with one of said recesses (8), and

that said shaft (15) is adapted for manual operation of the device, wherein said pawl actuating arm (16) comes into said contact with one of the pawls (11 or 12) through said manual rotation of the shaft (15), whereby the boss (9) is effectively disengaged from potential motor drive.

2.

The device as disclosed in claim 1, c h a r a c t e r i z e d i n that the spring (14) extends over an arc in the range of 200-340°, preferably about 260-290°.

3.

Utilization of a power transmission device as disclosed in claim 1 or 2 to carry out spring tensioning in a coupling mechanism on a medium voltage switch.

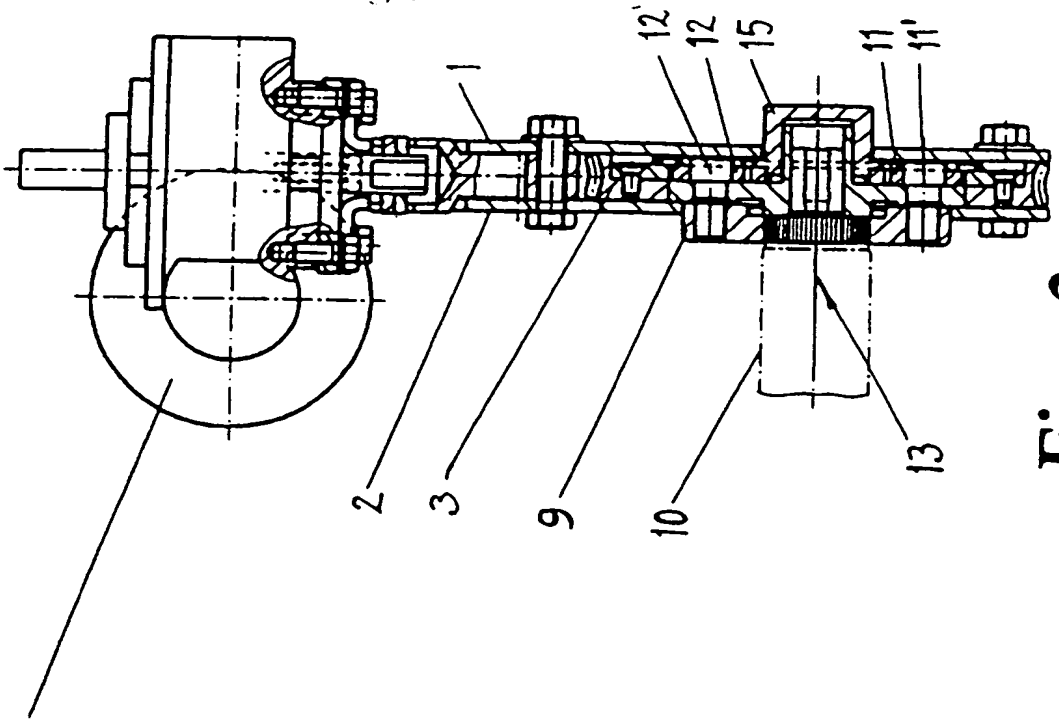

12'
12
15
11
11'
1
2
3
9
10
13

Fig. 2

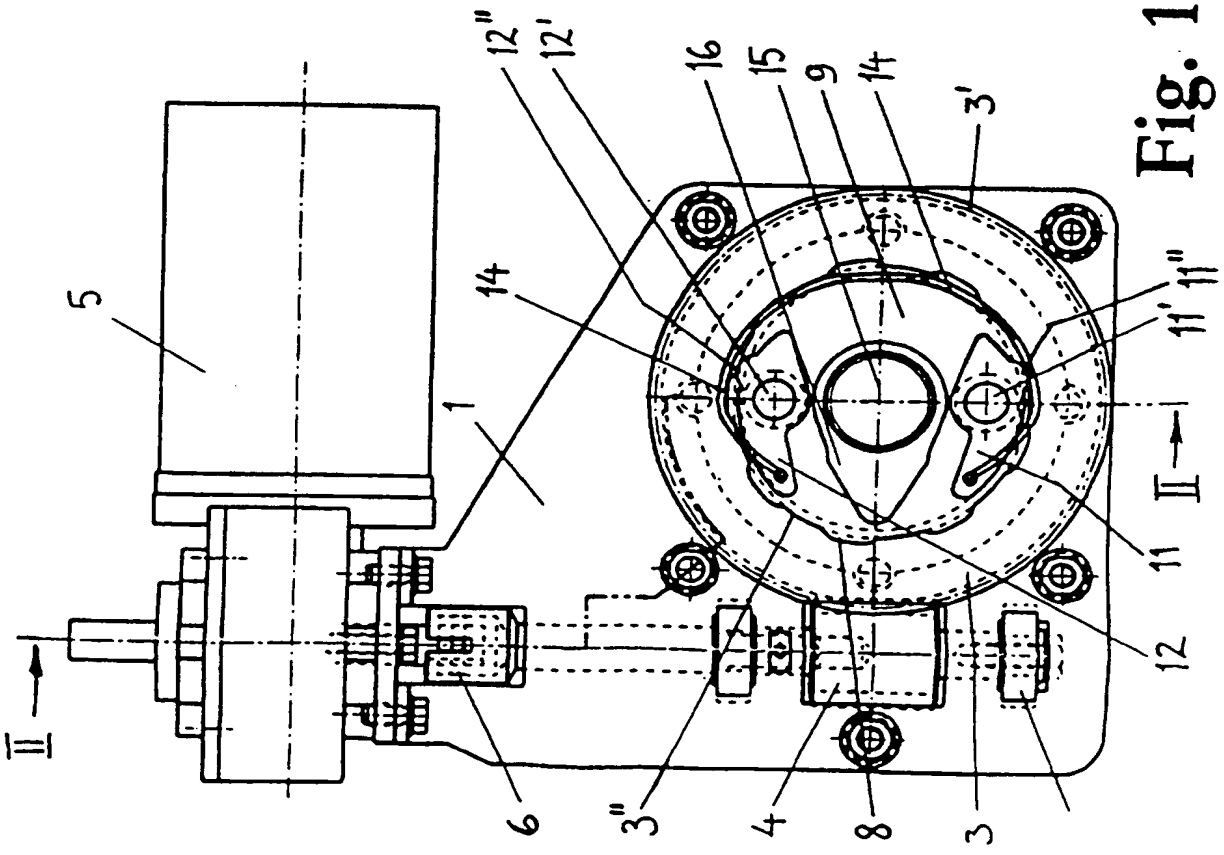

12"
12'
16
15
9
14
3'
5
14
1
11'
11"
II
II
11
12
6
3"
4
8
3

Fig. 1

Fig. 3

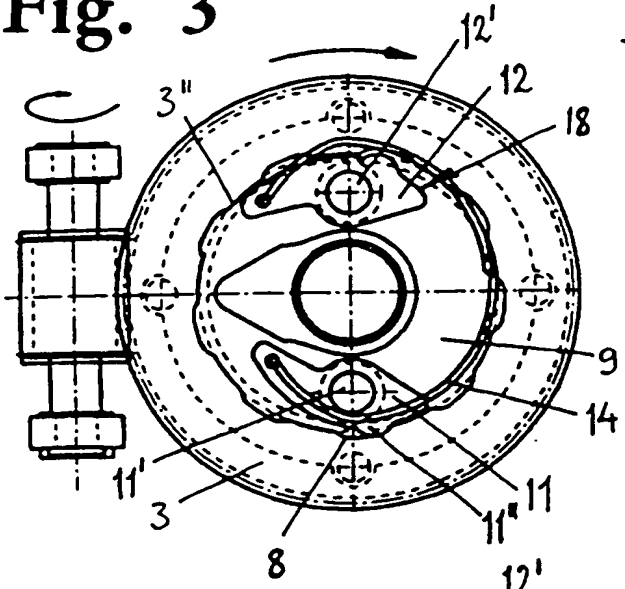
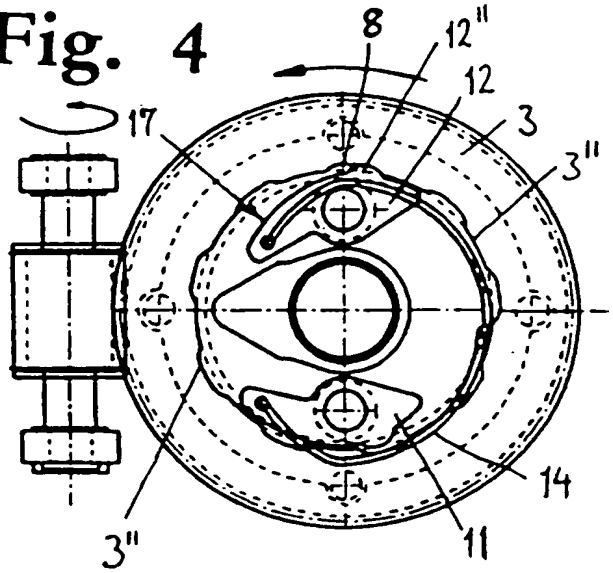


Fig. 4



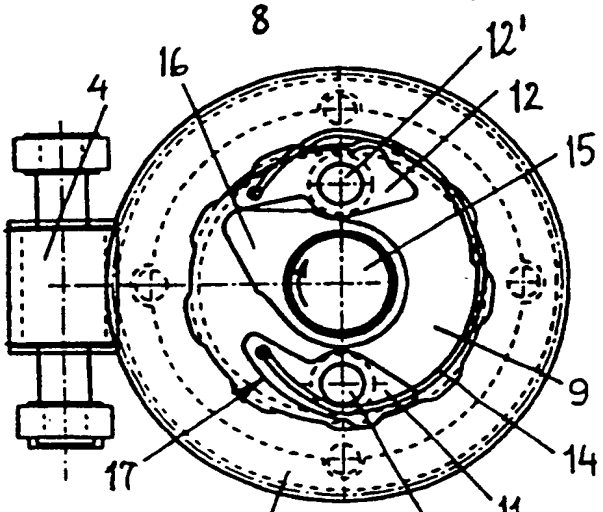


Fig. 5

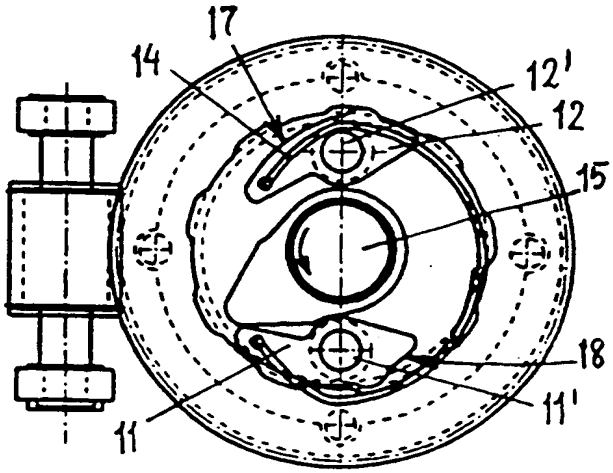


Fig. 6

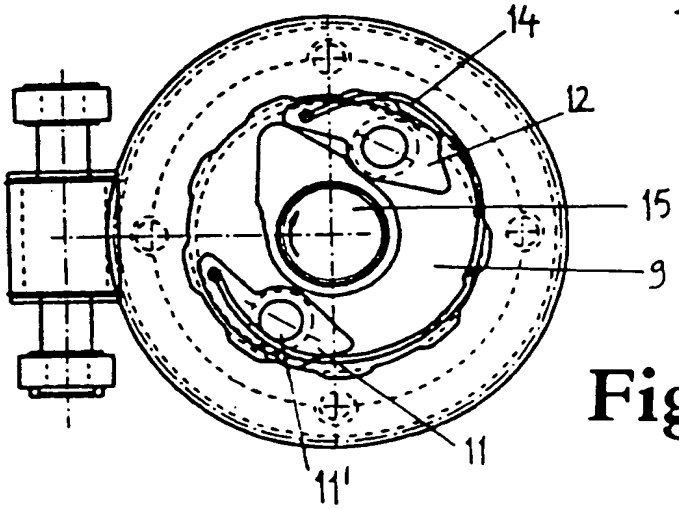


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 96/00257

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: F16H 35/18, H01H 3/22, F16D 41/12
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

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IPC6: F16H, F16D, H01H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3976172 A (F'GEPPERT), 24 August 1976 (24.08.76) --	1-3
A	US 4107486 A (EVANS), 15 August 1978 (15.08.78) --	1-3
A	US 1908905 A (E.E. LANDAHL), 16 May 1933 (16.05.33) -- --------	1-3

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Date of the actual completion of the international search	Date of mailing of the international search report
27 January 1997	04 -02- 1997
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Per-Olof Warnbo Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

28/10/96

International application No.
PCT/NO 96/00257

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3976172	24/08/76	NONE	
US-A- 4107486	15/08/78	CA-A- 1082757	29/07/80
		CA-A- 1089898	18/11/80
US-A- 1908905	16/05/33	NONE	